RECIPROCITY

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NEW PARTICLES PUZZLE THEORISTS

PHYSICS TODAY, the news organ of the American Physical Society, reports in its January, 1975, issue, pp. 17-25, that theoretical physicists don't know what to make of two newly-discovered high-energy particles.

There is no doubt that these particles, now identified as having energies respectively of 3.695 GeV and 3.1 GeV, do exist and have existed all along, although they have been unknown to elementary particle, nuclear physics, quantum mechanics, and relativity theorists.

This situation leads us to point out the possibility that the prevailing theory of physics is based in some part on false assumption, since the sanctioned physical theory was not capable of predicting existence of these "new" particles.

Responsible theorists are seriously concerned with locating the area of false assumption. There are many places to look, due to the disparate and diverse areas which make up theoretical physics today. Do we look for clues to solve the puzzle in elementary particle theory? Or in quantum mechanics? Or in relativity theory? Or maybe a fundamental principle which cuts across all of normal theoretical physics?

The editor of RECIPROCITY wishes to draw the attention of all interested scientists to such a clue, which we think affords the best available interpretation of at least one and perhaps both of these two recently-found particles. The clue takes the form of a new unified general theory of physics, published as early as 1959 and known as the reciprocity theory, originated by Mr. D. B. Larson, author, researcher, and engineer, of Portland, Oregon.

In a succession of works, The Structure of the Physical Universe (1959), The Case Against the Nuclear Atom (1963), Beyond Newton (1964), New Light on Space and Time (1965), Quasars and Pulsars (1971), etc, published by North Pacific Publishers (P.O. Box 13255, Portland, Oregon 97213), Larson has created the reciprocity system of physical theory from two fundamental postulates. The theory is incidentally applicable to and in fact from the beginning has been adequately designed for disclosing the nature of the two latest-found particles.

The report of a proposed interpretation, in the light of the Larson reciprocity theory, of the psi (3695) and psi (3100) particles and some other related "elementary" particles, is published in this issue of RECIPROCITY. It appears as the feature article, COSMIC RAYS AND ELEMENTARY PARTICLES by R. W. Satz.

APPRECIATION OF R. W. SATZ

Mr. Ronald W. Satz has been a prime mover in the formation of New Science Advocates, which publishes RECIPROCITY; and since its formation has served the group as Secretary. Satz created the RECIPROCITY column, The Question Box. He has a Bachelor of Science degree in Engineering Science, and a Master of Engineering in Transport Engineering, from the Renssalaer Polytechnic Institute, and has since completed advanced graduate study and research at the Massachusetts Institute of Technology. Mr. Satz now works in engine design with the Caterpillar Tractor Company at its world research center.

As an advanced and versatile student of reciprocity theory, Satz has authored an introductory outline of the work of D. B. Larson. Its apt title is The Unmysterious Universe. The book simply provides the necessary general background of the theory. The selling price is still $2.25 despite inflation. The 75-page pamphlet is available by communicating directly with Mr. Satz.

LETTER TO EDITOR

Dear Mr. Meyer:

The current issue of RECIPROCITY is excellent! Larson does a tremendous job as usual in explaining various aspects of RS theory. Although the details of Larson's arguments, frankly, are beyond me, the logic of his theory is so evident and so beautiful that you can't help but wonder why the "establishment" doesn't formally study it and show why it should or should not be accepted in principle. I realize my ideality is showing, but the concerned scientific community has the obligation in my estimation, to show that Larson does or does not have the answer.

Enclosed please find my check for $25.00 as a small contribution in support of RECIPROCITY.

Keep up the fight!

Very truly yours,

Frank A. Anderson
Associate Dean and
Chairman, Department of
Chemical Engineering
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INCORPORATION OF NSA

Whatever is worthwhile costs. While costly to effect, New Science Advocates should be incorporated. The aim is to promote and facilitate our growth. A most essential institution for the steady progress and advancement of our organization and its objectives is our news organ, the periodical RECIPROCITY. The science news letter is produced with the aid and cooperation of members across several states. Since RECIPROCITY is mailed in Wisconsin, we plan to incorporate NSA in the Great Lakes State.

COSMIC RAYS AND ELEMENTARY PARTICLES
A View of the Reciprocal System

Ronald W. Satz

Introduction

Recently the existence of two new particles has been discovered at the Brookhaven National Laboratory and the SLAC-Lawrence Berkeley Laboratory. They have been named the psi (3695) and psi (3100) resonances (although their exact masses, in MeV/c^2, are still somewhat in dispute). A whole bumper crop of theories has sprung up to explain these heavy resonances. In this endeavor physicists are postulating quantities such as "charm, color, paracharge, gentleness and chimerity". These terms are added to the original term, "strangeness". In this paper an explanation of these particles, others like them, and their natural origins, will be offered without the use of any quantity such as "charm".

I. Critique of Present Theory

Around the turn of the present century physicists had just two particles to work with: the electron and the proton. The theory then was that the atom was composed only of these particles. In 1932 the neutron was discovered and added to the list of particles contained within the atom. At the same time the positron was discovered, but not added to the list of particles contained within the atom. Then during the 1940's the first two mesons, the muon and the pion, were discovered. The physicists found that they could use the pi meson to "explain" the force of attraction between protons and neutrons within the postulated atomic nucleus. But they knew of no function for the mu meson.

With the increase of energy in the linear accelerators and storage rings in the last two decades, scores of new particles were found. Certainly physicists could not assume that all played a role in atomic structure. They decided that some particles are more elementary than others: the present theory is that all the particles of the universe are made up of three "quarks" and three "anti-quarks". These somehow combine to make up every other particle. (The original theory postulated an eight-fold way, but that hypothesis has broken down).

There are two immediate criticisms to the quark hypothesis:

1. In all attempts to find quarks, no one has succeeded - it seems that every time an attempt is made, new particles are discovered, but unfortunately, they aren't quarks.
2. The quark theory gives no indication as to how matter can change into radiation and vice versa.

Another aspect of present theory concerns the forces between particles. In essence the theory states that all forces arise from the exchange of quanta, as follows:

1. Gravity results from the exchange of "gravitons".
2. Electromagnetic forces result from the exchange of "virtual photons".
3. The weak beta decay of atoms results from the exchange of "the weak boson W".
4. The strong nuclear forces result from the "exchange of mesons between nucleons".
5. Chemical attraction between atoms results from the exchange of electrons.

All of these hypotheses suffer from one and the same defect: none of the exchange particles has ever been observed in action doing what they are supposed to be doing. Despite major efforts no one has observed gravitons, weak bosons, exchange electrons or exchange photons. (The last category is, by definition, not observable; hence there is no way to test the latter theory.) Nor has the actual mechanism of coupling ever been specified. It may be true that an exchange of gifts in the human realm promotes bonds of friendship and it is true that our rate of effecting closer bonds is limited to the speed of light. But the atomic realm is different. There the communication of forces is evidently instantaneous; there is no time factor in Newton's law of gravitational force or Conlomb's law of electrostatic force. To postulate an exchange of force and to limit the propagation speed to that of light is, in a sense, anthropomorphic.

II. The Theory of the Reciprocal System

In the Reciprocal System as advanced by D. B. Larson in his books, beginning with the STRUCTURE OF THE PHYSICAL UNIVERSE, no particle is posited as being actually elementary. The fundamental component of the universe is not a set of matter particles (quarks). Rather, the fundamental component is MOTION, existing in discrete units. Quantitatively, the motion may be above or below unit value (one unit of space per unit of time). In the sector we live in, the motion is ordinarily below unity. According to the theory, another sector exists with motion above unity.

In our sector exists a series of chemical elements and sub-atomic particles, each a specific quantity of motion. Likewise the other sector has a series of chemical elements and sub-atomic particles. In our sector there exist stupendous galactic explosions resulting in quasars, whose matter, the theory postulates, leaves our sector and enters the inverse sector. Likewise, in the other sector stupendous galactic explosions occur, in which inverse matter is dispersed into our sector. This dispersed, very energetic inverse matter may be identified as cosmic rays.

In Mr. Larson's theory an atom, either in this sector or the other, is NOT composed of protons, neutrons and electrons (or their "anti-particles"). Rather each atom and each cosmic atom has a specific quantity of rotational motion about three perpendicular axes. All of the particles, whether atoms, mesons, resonances or baryons, are units of motion, some having more than others. The rotational motion making up the particles can, under certain conditions, convert to linear motion or radiation. Forces arise from the interaction of the particles' motion with that of the space-time progression. The latter is the general translational outward motion of the universe, which arises from the equivalence of single units of space and time. Since the particles and the progression are always interacting, there is no propagation of gravitational or electrostatic force and thus NO speed limit.

In our sector the most common element is hydrogen. According to theory, H^2 (deuteron) is the natural atom, and H^1 is H^2 with a magnetic charge. Likewise in the other sector the most common element is designated cosmic hydrogen, co-H^2 (co-deuteron). This co-H^2 is the most common natural cosmic atom, and co-H^1 is co-H^2 with a cosmic magnetic charge.

In the cosmic ray stream cosmic hydrogen should be much more abundant than other cosmic elements. As elements constructed of motion above unity, these cosmic elements should have properties the inverse of those ordinarily associated

with corresponding elements in our sector. This means that their masses must be the reciprocals of the masses of their namesakes in this sector. Mathematically, the mass of a cosmic element is

$$m_{\text{co-element}} = 1/n \text{ natural mass units}$$

$$= 2/n \text{ atomic mass units}$$

$$= 364.66/n \text{ electron mass units}$$

$$= 1862.95/n \text{ MeV}/c^2$$

where n is the cosmic atomic number. In the case of cosmic isotopes,

$$m_{\text{co-element}} = 1862.95/(n + \tfrac{1}{2}G) \text{ MeV}/c^2,$$

where G is the number of cosmic gravitational charges. Once in our sector the co-elements are subject to the same forces that produce material isotopes. Let I be the number of material isotopic charges. Then the complete mass equation (ignoring secondary mass effects) is

$$m_{\text{co-element}} = (1862.95/(n+\tfrac{1}{2}G) + I(931.478) \text{ MeV}/c^2,$$

where I and G must have opposite signs for compatible motions.

Using the first equation above for cosmic deuteron, I find that it has the same mass as deuteron in our sector. Once in our sector, with its lower translational velocity and its change in space-time reference point, the cosmic deuteron transforms to the deuteron of our sector. This is a true CPT transformation: an inversion of space-time coordinates followed by an interchange of a particle and "anti-particle". Momentum and energy are conserved in this transformation.

III. Critiquing the Reciprocal Theory

Old readers of Mr. Larson's books will note that here I am disagreeing with the original presentation of the theory. There it was said that cosmic helium transformed to cosmic krypton, emitting neutrons along the way, until finally the cosmic krypton converted into a neutron (or equivalent). Although the present author agrees with Mr. Larson on the framework of the theory, here we differ on details. Since the New Science Advocates is not a religious sect, but a scientific body, members have the freedom, indeed the obligation, to question the details of the theory. Cosmic krypton cannot decay to a neutron because to do so would violate the conservation law of momentum and energy. One body decays, except in the case of hydrogen, are simply impossible. Furthermore, a cosmic element in the middle of the cosmic periodic table of elements cannot emit a neutron to move to the last column in the table, anymore than an element in the middle of our periodic table could accept a neutron to move to the last column of the table.

I thus conclude that cosmic hydrogen transforms to our hydrogen, rather than that cosmic krypton transforms to a neutron.

Once transformed, the new deuteron is unstable in our atmosphere and soon decays to a proton, electron and neutrino. Thus, the cosmic ray stream is composed mostly of high energy protons, precisely as observed.

Other cosmic elements and their isotopes exist in the cosmic ray stream and are produced in laboratories on earth. Because of the variability in G and I, two different particles can sometimes have the same mass. Thus identification of particles cannot be based solely on mass. Some of the better known heavy mesons (hyperons) together with their probable identifications are here listed:

SYMBOL	OBSERVED MASS	n	G	I	IDENTIFICATION
Ψ	3695	1	-1	0	co-H^1
		1	0	2	co-H^2 + 2
		½	0	0	co-n
ρ	751	2	1	0	co-He^5
Ω	1672.5	3	-1	1	co-Li^5 + 1
η	547	3	1	0	co-Li^7
Ξ	1304	5	0	1	co-B^{10} + 1
Δ	1236	6	0	1	co-C^{12} + 1
Ψ	3100	6	0	3	co-C^{12} + 3
Σ	1198	7	0	1	co-N^{14} + 1
Λ	1118	10	0	1	co-Ne^{20} + 1

I think that the recently found psi (3695) particle is either cosmic hydrogen, isotope 1 or cosmic deuteron with two material isotopic charges or cosmic neutron. A firm decision will have to await experimental results.

On the basis of preliminary calculation I tentatively submit that the other recently found particle psi (3100), is cosmic carbon with three material isotopic charges.

In addition to the heavy mesons two light mesons are commonly observed in the cosmic ray streams and produced in laboratories on earth: the muon and the pion. I agree with D. B. Larson that the muon is co-argon and the pion is co-silicon. On earth these mesons are created from kinetic energy; an energetic proton strikes another proton, producing a third particle, the pion. This pion decays to a muon and neutrino. I do not agree with Mr. Larson that the muon then decays to co-cobalt and then to co-krypton. My reading of the evidence indicates that the muon simply decays to positrons and neutrinos. The rotational kinetic energy is converted to linear kinetic energy of simple rotational units, positrons or electrons or neutrinos. The light mesons are created fromkinetic energy and to kinetic energy they return.

Before it decays, the pion is "strongly interacting", because it has both space and time displacements. The muon is "weakly interacting", because it has only space displacements. This is also the reason why muons are the "hard" component of cosmic rays -- they can penetrate many meters into the ground.

In the decay processes certain conservation laws seem to hold true. Physicists are currently proposing one new conservation law after another (strangeness number, hypercharge, paracharge, charm, baryon number, lepton number, etc.). In the Reciprocal System there is but one conservation law: space-time displacements can be neither created nor destroyed. Energy, t/s, and thus momentum, $(t/s)^2$, are conserved. In some reactions certain groups of space-time units are conserved, for example, electric charge.

In many cases the heavy mesons decay to the lambda meson, which then ejects a neutron. The remaining pion, if neutral, decays to two gamma rays. If charged, the pion decays to a muon, which then transforms to a positron (or electron) and neutrino. The somewhat lighter mesons, the eta, the rho, and the (small letter) omega, decay to two or more pions. The theoretical explanation of decay process involves probability: smaller quantities are more probable than larger ones. In the steps from rotational kinetic energy to translational kinetic energy, the fewest number of particles are utilized. The decay pattern of the new particles appears to be along these lines. The psi (3695) decays to the psi (3100), emitting two pions, and then the psi (3100) decays to two muons. Many questions, however, still remain to be answered.

CONCLUSION

The following are the essentials of the new theory:

1. A sector, the inverse of ours, is hypothesized, which provides a natural source for scores of new particles, such as the mesons.
2. The cosmic rays are a stream of such particles coming from the inverse sector.
3. The masses of these particles are the inverses of their namesakes in our sector.
4. Inverse deuteron is equivalent to and converts to our deuteron. The most abundant element in the cosmic sector converts to the most abundant element in our sector.
5. Cosmic atoms may have cosmic isotopic charges and/or material isotopic charges.
6. The cosmic elements in the cosmic ray stream, other than hydrogen, decay eventually to the kinetic energy of simple rotational units, the electron, the positron, the neutrino. In our laboratories mesons are created out of kinetic energy. In our atmosphere the natural mesons return to kinetic energy.
7. All conservation laws relate to one: space-time displacements are neither created nor destroyed.

LETTER TO EDITOR

Dear Prof. Meyer,

In my opinion, the development of the consequences of the postulates of the Reciprocal System of theory, and the correlation of these consequences with the results of observation, have now been carried far enough to make it evident that the theoretical system is basically correct. There are, however, many questions still remaining with reference to the details, even in the areas that have already been studied, and, of course, there are a great many other areas yet to be examined.

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I believe it is very desirable to encourage free and open discussion of the theory and its application, so that we can have the benefit of as many points of view as possible in extending and clarifying the theoretical structure, and I want to avoid saying or doing anything that might give the impression that I am trying to discourage dissenting opinions. For that reason I would prefer not to comment at this time on Ronald Satz' article discussing the newly discovered heavy "resonances", except to say that I agree with his conclusions 1, 2, 3 and 7, and in part, with conclusion 5. I hope that readers of RECIPROCITY will give this article careful consideration, and will not hesitate to express their opinions, pro and con, in "letters to the editor".

D. B. Larson

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